

WHAT IS CLAIMED IS:

1. A system for computing probability distribution of loan losses in a financing organization having a plurality of loan customers, comprising:

an input means for inputting loan amounts loaned to each said loan customer and bankruptcy probabilities of each said loan customer;

a characteristic function calculating means for calculating a characteristic function on the basis of each said loan amount and each said bankruptcy probability inputted through said input means;

a probability distribution calculating means for calculating a probability distribution by Fourier transform inversion of said characteristic function calculated by said characteristic function calculating means; and

a probability distribution output means for outputting said probability distribution calculated by said probability distribution calculating means.

2. The system for computing probability distribution of loan losses according to claim 1 wherein said probability distribution calculating means uses fast Fourier transform technique for said Fourier transform inversion.

3. The system for computing probability distribution of loan losses according to claim 1 further comprising a loan amount rounding means for rounding each said loan amount inputted through said input means to a number integer times of a predetermined unit.

4. The system for computing probability distribution of loan losses according to claim 1 wherein said probability distribution output means outputs a graph grading probability densities on its ordinate and loan losses on its abscissa, the maximum value on the abscissa of said graph being the sum of said loan amounts.

5. The system for computing probability distribution of loan losses according to claim 1 wherein said probability distribution output means outputs a graph grading probability densities on its ordinate and loan losses on its abscissa, the maximum value on the abscissa of said graph being a loan loss over which probability of occurrence can be regarded substantially zero in the calculating process.

6. A system for computing probability distribution of loan losses in a financing organization having a plurality of loan customers, comprising:

an acquiring means for acquiring rating fluctuation probabilities which are the probabilities of fluctuation in ratings of each said loan customer, and credit value changing amount which are changes in value of the credit to each said loan customer caused by the fluctuation in the ratings thereof;

a characteristic function calculating means for calculating a characteristic function on the basis of each said rating fluctuation probability and each said credit value changing amount;

a probability distribution calculating means for calculating a probability distribution by Fourier transform inversion of said characteristic function calculated by said characteristic function calculating means; and

a probability distribution output means for outputting said probability distribution calculated by said probability distribution calculating means.

7. The system for computing probability distribution of loan losses according to claim 6 wherein said acquiring means includes:

an input means for inputting loan amounts loaned to each said loan customers and loss ratios caused by fluctuations in rating of each said loan customers; and

a changing amount calculating means for calculating said credit value changing amount of each said loan customer from each said loan amount and each said loss ratio.

8. A system for computing probability distribution of loan losses in a financing organization having a plurality of loan customers, comprising:

an input means for inputting loan amounts loaned to each said loan customer and bankruptcy probabilities of each said loan customer;

a actual loss calculating means for calculating actual losses which are amounts of the losses said financing organization may substantially suffer when each said loan customer goes into bankruptcy;

a characteristic function calculating means for calculating a characteristic function on the basis of said actual losses and said bankruptcy probabilities;

a probability distribution calculating means for calculating a probability distribution by Fourier transform inversion of said characteristic function calculated by said characteristic function calculating means; and

a probability distribution output means for outputting said probability distribution calculated by said probability distribution calculating means.

9. A system for computing probability distribution of loan losses in a financing organization having a plurality of loan customers, comprising:

a scenario acquiring means for acquiring a plurality of actual losses which are amounts of losses said financing organization may suffer when each said loan customer goes into bankruptcy by predicting future fluctuations, and a plurality of bankruptcy probabilities of each said loan customer by predicting future fluctuations, and using these values as a plurality of scenarios;

a characteristic function calculating means for calculating characteristic functions for each said scenario on the basis of said actual losses and said bankruptcy probabilities acquired by said scenario acquiring means;

a probability distribution calculating means for calculating probability distributions for each said scenario by

Fourier transform inversion of said characteristic functions calculated by said characteristic function calculating means;

an average probability distribution calculating means for calculating an average probability distribution which is the average of said probability distributions for each said scenario; and

a probability distribution output means for outputting said average probability distribution calculated by said average probability distribution calculating means.

10. A system for computing probability distribution of loan losses in a financing organization having a plurality of loan customers, comprising:

a scenario acquiring means for acquiring a plurality of actual losses which are amounts of losses said financing organization may suffer when each said loan customer goes into bankruptcy by predicting future fluctuations, and a plurality of bankruptcy probabilities of each said loan customer by predicting future fluctuations, and using these values as a plurality of scenarios;

a characteristic function calculating means for calculating characteristic functions for each said scenario on the basis of said plurality of actual losses and bankruptcy probabilities acquired by said scenario acquiring means;

a probability distribution calculating means for calculating probability distributions for each said scenario by Fourier transform inversion of said characteristic functions calculated by said characteristic function calculating means; and

a probability distribution output means for outputting said probability distributions calculated by said probability distribution calculating means for each said scenario.

11. A system for computing probability distribution of loan losses in a financing organization having a plurality of loan customers, comprising:

a scenario acquiring means for acquiring loan amounts of

each loan customer and acquiring a plurality of bankruptcy probabilities of each said loan customer by predicting future fluctuations, and then using these values as a plurality of scenarios;

a characteristic function calculating means for calculating characteristic functions for each said scenario on the basis of said loan amounts and said bankruptcy probabilities acquired by said scenario acquiring means;

a probability distribution calculating means for calculating probability distributions for each said scenario by Fourier transform inversion of said characteristic functions calculated by said characteristic function calculating means;

an average probability distribution calculating means for calculating an average probability distribution which is the average of said probability distributions for each said scenario; and

a probability distribution output means for outputting said average probability distribution calculated by said average probability distribution calculating means.

12. A system for computing probability distribution of loan losses in a financing organization having a plurality of loan customers, comprising:

a scenario acquiring means for acquiring loan amounts of each loan customer and acquiring a plurality of bankruptcy probabilities of each said loan customer by predicting future fluctuations, and then using these values as a plurality of scenarios;

a characteristic function calculating means for calculating characteristic functions for each said scenario on the basis of said loan amounts and said bankruptcy probabilities acquired by said scenario acquiring means;

a probability distribution calculating means for calculating probability distributions for each said scenario by Fourier transform inversion of said characteristic functions calculated by said characteristic function calculating means; and

a probability distribution output means for outputting said probability distributions calculated by said probability distribution calculating means for each said scenario.

13. The system for computing probability distribution according to claim 11 wherein said scenario acquiring means expresses probabilities of bankruptcy of said loan customers by a function, and acquires said plurality of bankruptcy probabilities according to said function.

14. The system for computing probability distribution according to claim 13 wherein said function expressing probabilities of said loan customers is

$$\text{Norm}\left(Y_k - \sum_{r=1}^R a_{kr} u_r\right)$$

where k indicates each loan customer, u_r are random variables according to an R-dimensional normal distribution, and a_{kr} are constants.

15. The system for computing probability distribution according to claim 13 wherein said function expressing probabilities of said loan customers is

$$\text{Norm}(Y_k - a_k u)$$

where k indicates each loan customer, u is a random variable, and a_k is a constant.

16. A system for computing probability distribution of loan losses in a financing organization having N loan customers $k=1 \dots N$ comprising:

an input means for inputting loan amounts M_k to each said N loan customers $k=1 \dots N$ and bankruptcy probabilities p_k thereof;
a loan customer calculating means for calculating the number

N of said loan customers on the basis of said loan amounts M_k and/or said bankruptcy probabilities p_k inputted by said input means;

a characteristic function calculating means for calculating a characteristic function

$$\phi(t) = \prod_{k=1}^N \{1 + p_k (\exp(itM_k) - 1)\}$$

at each t of $t = 2\pi m / (2^{2n})$ ($m = 0, 1, 2, \dots, 2^{2n} - 1$) for the number of points n of Fourier transform;

a probability distribution calculating means for calculating a probability distribution by Fourier transform inversion of said characteristic function calculated by said characteristic function calculating means, by using a fast Fourier transform technique; and

a probability distribution output means for outputting said probability distribution calculated by said probability distribution calculating means.

17. The system for computing probability distribution according to claim 16 wherein $2^{2n} - 1$ which is the greatest value of m in said characteristic function calculating means is a value not less than the sum of all loan amounts.

18. The system for computing probability distribution according to claim 16 wherein $2^{2n} - 1$ which is the greatest value of m in said characteristic function calculating means is a value not less than the minimum of values for which probability of loan losses can be regarded substantially zero in the calculation process.

19. The system for computing probability distribution according to claim 16 further comprising a loan amount rounding means for rounding each said loan amount inputted through said input means to a number integer times of a predetermined unit, and

$2^{2n} - 1$ which is the greatest value of m in said characteristic

function calculating means being a value not less than the quotient obtained by dividing the sum of all loan amounts by said predetermined unit.

20. The system for computing probability distribution according to claim 16 further comprising a loan amount rounding means for rounding each said loan amount inputted through said input means to a number integer times of a predetermined unit, and

$2^{2n}-1$ which is the greatest value of m in said characteristic function calculating means being a value not less than the quotient obtained by dividing by said predetermined unit the minimum of values for which probability of loan losses can be regarded substantially zero in the calculation process.

21. A method for computing probability distribution of loan losses in a financing organization having a plurality of loan customers, comprising:

an input process for inputting loan amounts loaned to each said loan customer and bankruptcy probabilities of each said loan customer;

a characteristic function calculating process for calculating a characteristic function on the basis of said loan losses and said bankruptcy probabilities;

a probability distribution calculating process for calculating a probability distribution by Fourier transform inversion of said characteristic function calculated by said characteristic function calculating process; and

a probability distribution output process for outputting said probability distribution calculated by said probability distribution calculating process.

22. A recording medium storing a program for calculating a probability distribution of loan losses in a financing organization having a plurality of loan customers, in which said program comprising:

an input process for inputting loan amounts loaned to each

said loan customer and bankruptcy probabilities of each said loan customer;

a characteristic function calculating process for calculating a characteristic function on the basis of said loan losses and said bankruptcy probabilities;

a probability distribution calculating process for calculating a probability distribution by Fourier transform inversion of said characteristic function calculated by said characteristic function calculating process; and

a probability distribution output process for outputting said probability distribution calculated by said probability distribution calculating process.